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10/027,476	12/21/2001	Jimmy Kuo Chen	276440-21	9965

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EXAMINER	
NGUYEN, DONGHAI D	
ART UNIT	**PAPER NUMBER**
3729	

DATE MAILED: 03/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/027,476	CHEN, JIMMY KUO	
	Examiner	Art Unit	
	Donghai D. Nguyen	3729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12,16-22 and 24-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-10,12,16-22 and 24-29* is/are rejected.

7)☒ Claim(s) *6 and 11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on 12 January 2006 has been considered and made of record.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 26-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In this case the subject matter such as probe(s) and the interconnection between these probes and the substrate are not described in the specification.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claims 26-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a) It's not clear as to how a plurality of probes, a substrate and contacts are being formed in prior to the placing step. Also the limitation recited "wherein said probes are able to make

connection between said contactor and an electrical device" (claim 26, lines 3-4) appears to be incorrect because in line 2 of claim 26 recites that the contactor comprising a substrate and a plurality of probes. Therefore, it is no need to connect the probes to the contactor.

b) What's being referring as "probes and what's the relation between the probes and the contactor?

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5, 7, 10 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 4,983,804 to Chan et al.

Regarding claims 1 and 16, Chan et al disclose a method for heat treating a plurality of conductive interconnect structures (30-33) attached to a substrate (11/12/42), the method comprising the steps of: providing a contactor (10) comprising a substrate (insulation substrate 11/12/42) and a plurality of conductive interconnect structures (30-33 see Fig. 4); placing the contactor in an oscillating electromagnetic field, the oscillating electromagnetic field heating the interconnect structure without substantially heating the substrate (Col. 2, lines 46-48); maintaining the contactor in the field heating field until each of the interconnect structures obtains a defined heat-treatment temperature substantially greater than an ambient temperature for a predetermined period of time sufficient to permanently change a mechanical operating

property of the interconnect structures (Col. 3, lines 18-24). Note that the interconnect structures i.e., solders are melt and bonded to the pads, therefore the interconnect structures changed that change their physical/mechanical operative.

Regarding claims 2-5 and 10, Chan et al disclose the interconnect structures comprising ferromagnetic material, i.e., nickel-cobalt alloy (claims 2-3, see Col. 3, lines 3-5) and tuning the oscillating electromagnetic field for selectively heating the ferromagnetic material (claim 4) to temperature greater than 800° C (claim 5, see Figs. 3 and 5-12 Note that the heat-treatment temperature depends on the content of the ferromagnetic material).

Regarding claim 7, Fig. 2 or 4 of Chan et al shows the oscillating electromagnetic field generates between a pair of plates.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-5, 7-10, 13-16, 18-22 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,150,186 to Chen et al in view of either US Patent 4,983,804 to Chan et al or US Patent 5,418,811 to Ruffini et al.

Regarding claims 1, 16, 18-22 and 25, Chen et al disclose a method for heat treating a plurality of conductive interconnect structures attached to a substrate, the method comprising the steps of: providing a contactor (Figs. 2 or 3) comprising a substrate (semiconductor wafer 202)

and a plurality of conductive interconnect structures (wires/springs 204/208/212 met the limitations of claim 19) each of the interconnect structures is attached to a terminal on the substrate and comprises a contact tip disposed away from the substrate (See Figs. 2-3 for limitations claim 21); placing the contactor in heating field; maintaining the contactor in the field heating field until each of the interconnect structures obtains a defined heat-treatment temperature substantially greater than an ambient temperature for a predetermined period of time sufficient to permanently change a mechanical operating property of the interconnect structure (Fig. 1 and Abstract, lines 1-3); removing the contactor from the heating field (it is inherent that the contact be removed from heating field to room temperature for cooling down); and cooling the interconnect structures to the ambient temperature (Col. 3, lines Col. 11, lines 39-44, met the limitations of claim 22).

Chen et al is silent regarding how the contactor is subjected to heat treatment. Chan et al teach the step of placing an electrical device (Figs. 2/4) in an oscillating electromagnetic field for heating the interconnect structures (30-35) without substantially heating the substrate (localize heating, see Col. 2, lines 46-48). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chen et al's method for heat treatment the contact by placing the contactor in the oscillating electromagnetic field as taught by Chan et al for heating the interconnect structures without substantially heating the substrate.

Additionally, Ruffini et al teach the using oscillating electromagnetic field for heating, annealing, heat treatment/hardening in metal working industry is well known in the art because the oscillating electromagnetic field which induces electrical current in a work piece, "interconnect structures", (see Ruffini et al Col. 1, lines 13-36) to provide many advantages such

as heating is localized, providing uniform high quality heat treatment etc. (See Ruffini et al, Col. 1, lines 37-61). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilizing the oscillating electromagnetic field for heating the interconnect structures of Chen to obtain the desired improvement of mechanical properties of the interconnect structures.

The limitations of claims 16, 18-22 and 25 also met as set forth above.

Regarding claims 2-3, Chen et al disclose the interconnect structures are comprised of a ferromagnetic material which is a nickel-cobalt alloy (Col. 6, lines 1-19).

Regarding claims 4-7 and 10, Chen et al do not teach the step of tuning the oscillating electromagnetic field between a pair of plates (claim 7), to a resonant frequency of a field generator circuit (claim 10) for selectively heating the ferromagnetic material (claim 4) and obtaining the heat treatment temperature greater than 800° C (claim 5). Chan et al disclose tuning the oscillating electromagnetic field between a pair of plates (23, 24), to a resonant frequency of a field generator circuit that selectively heat the ferromagnetic material and obtain the heat treatment temperature greater than 800° C (see Figs. 3, 5-12; note that the heat-treatment temperature depends on the content of the ferromagnetic material) for preventing damage to other sensitive component/substrate (Col. 3, lines 58-60). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the Chan et al heating method onto the method invention of Chen et al for benefit of preventing damage to the associated component/substrate.

Regarding limitation of claims 8 and 9. It would have been an obvious matter of design choice to choose coil element i.e., size, shape, and configuration, since Applicant has not

disclosed that the claimed specifics coil shape including copper tube or hairpin coil for generating the oscillating electromagnetic field would solve any stated problem or for any particular purpose and it appears that the invention would perform equally well with the coil element (23/24) of Chan et al reference.

Regarding claim 24, Chen et al disclose heating the interconnect structures to a temperature that is less than the melting temperature of the interconnect structures (Col. 3, lines 44-48).

Regarding claim 26 as best understood, Chen et al disclose a method comprising: providing a contactor (Figs. 2-3) comprising a substrate (202) and a plurality of electrically conductive probes (wires/spring 204/208/212), each probe comprising a base portion attached to the contactor, a tip portion spaced from the contactor, and a body portion between the base portion and the tip portion (See Figs. 2-3), wherein said probes are able to make electrical connections between said contactor and an electronic device (see Col. 8, lines 46-53); and placing the contactor in a heat treatment device for a period of time the contactor in to a particular temperature (Col. 6, lines 20-30), wherein the period of time and the particular temperature are sufficient to change permanently at least one mechanical operating property of the probes, and the at least one mechanical operating property is one of increased yield strength, increased resistance to fatigue, decreased brittleness, or increased hardness (Col. 10, lines 48-56).

Chen et al do not teach the step of placing the contactor in an oscillating electromagnetic field. Chan et al teach the step of placing an electrical device (Figs. 2/4) in an oscillating

electromagnetic field for heating the interconnect structures (30-35, see Col. 2, lines 46-48). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chen et al's method for heat treatment the contact by placing the contactor in the oscillating electromagnetic field as taught by Chan et al for heat treating the contactor.

Additionally, Ruffini et al teach the using oscillating electromagnetic field for heating, annealing, heat treatment/hardening in metal working industry is well known in the art because the oscillating electromagnetic field which induces electrical current in a work piece, "interconnect structures", (see Ruffini et al Col. 1, lines 13-36) to provide many advantages such as heating is localized, providing uniform high quality heat treatment etc. (See Ruffini et al, Col. 1, lines 37-61). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilizing the oscillating electromagnetic field for heating the contactor of Chen to obtain the desired improvement of mechanical properties of the contactor.

Regarding claims 27-28 as best understood, Chen et al disclose making the probes (Col. 8, line 47) having attaching wires to terminals of the contactor, and over coating the wires with an over coat material (see Figs. 2-3) by depositing at least one material in openings in a plurality of masking layers patterned to define at least a portion of a shape of said probes (see Col. 9, lines 35-45 and Figs. 3A-C).

10. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Chan et al as modified and applied above, and further in view of US Patent 5,340,537 to Barrett.

Chen et al/Chan et al as modified and relied upon above do not teach the applying a heat-indicating paint to the plurality of microelectronic structures prior to the maintaining step as recited in claim 12. Barrett teaches the step of applying a heat-indicating paint to the plurality of microelectronic structures for measuring a temperature (col. 3, lines 9-17). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teaching applying a heat-indicating paint to the microelectronic structures as taught by Barrett onto the modified method invention of Chen et al/Chan et al in order to facilitate the fabrication process including measuring and controlling of the temperature.

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Chan et al as modified and applied above, and further in view of US patent 5,476,211 to Khandros.

Chen et at/Chan et al as modified and relied upon above do not teach the associated contactor comprising an interposer and the conductive interconnect structures are disposed on the opposing sides of the substrate as recited in claim 17. Khandros discloses the contactor (59) comprising an interposer (Figs. 18-21) and the conductive interconnect structures are disposed on the opposing sides of the substrate for electrically interconnecting between two substrates of surfaces of substrate (col. 15, lines 65-66 and Col. 16, lines 8-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the contactor having the configuration requirement as describe above as taught by Khandros onto the modified method of Chen et al in order to obtain an interconnecting structure between two surfaces.

12. Claim 29 as best understood is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al as modified and applied above, and further in view of US Patent 6,184,053 to Eldridge et al.

Chen/Chan/Ruffini et al do not teach making the probes by depositing a material in first, second and third openings in a first, second, and third masking layers to form said base, body and top portions of said probes. Eldridge et al teach the steps of depositing a material (114) in first, second and third openings in a first, second, and third masking layers (104, 106 and 108) to form said base, body and top portions of said probes (see Figs. 1A-C). It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the invention of making the probes of Chen/Chan/Ruffini et al by utilizing the teach above by Eldridge et al for fabricating plurality of probes having fine pitch or fine tolerance (see Col. 3, lines 43-46).

Response to Arguments

13. Applicant's arguments filed on 12 January 2006 have been fully considered but they are not persuasive.

a) Applicant argues that Chan et al do not teach "heating the interconnect structures or probes without substantially heating the substrate" ("Remarks" page 7, 1st paragraph). The Examiner disagrees for the flowing reasons: Applicant refers to the discussion at Col. 2, lines 46-48 of Chan reference for the teaching of heating the interconnection without heating the substrate such doing would preventing thermal heating other structural elements including

substrate (10/11). That is surrounding the localized heating interconnect structures in short period of time (see in details at Col. 3, lines 1 and 24-27).

b) Applicant argues that Chan et al do not permanently change a mechanical operation of the interconnect structure ("Remarks" page 6, 3rd paragraph). The Examiner disagrees since the melting solder changes its mechanical properties therefore the structure also changes its mechanical properties since solder is part of the interconnect structure.

c) Applicant argues that Chan et al do not disclose "the temperature as high as 800° C and tuning a frequency of the oscillating electromagnetic field" ("Remarks" page 7). The Examiner disagrees because Fig. 3 of Chan et al shows the operating temperature is above 800° C (see details at Col. 3, lines 3-11) at certain percentage of Ni, Fe and Co in the ferromagnetic material and Chan et al disclose the tuning the frequency of the oscillating electromagnetic field (Col. 3, lines 37-68).

d) In response to applicant's argument that there is no suggestion to combine the references (see "Remarks" pages 8-10), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Chen et al teach the heat treatment on the interconnect structures provide improvement the mechanical properties of the interconnect structures and Chan et al teach the step of localizing heat treatment the interconnect structures without affecting other components i.e. substrate surround the interconnect structure.

Furthermore, Ruffini et al also teach the heat treatment by oscillating electromagnetic field for localized heat treatment on metallic structures (see Col. 1, lines 37-61). These teachings are well known in the art as to provide many advantages over convection heating such as utilize the oscillating electromagnetic field for heating an interconnecting element without effecting its substrate as described in light of Chen et al and/or Ruffini above.

Allowable Subject Matter

14. Claims 6 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghai D. Nguyen whose telephone number is (571)-272-4566. The examiner can normally be reached on Monday-Friday (9:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter D. Vo can be reached on (571)-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DN
February 28, 2006

2/28/06
MINH TRINH
PRIMARY EXAMINER